JAPANESE PATENT OFFICE
PATENT JOURNAL (A)
KOKAI PATENT APPLICATION NO. HEI 5[1993]-103808

Int. Cl.^{5}:	A 61 F 9/00 2/16
Sequence Nos. for Office Use:	8119-4C 7038-4C
Filing No.:	Hei 3[1991]-142068
Filing Date:	June 13, 1991
Publication Date:	April 27, 1993
No. of Claims:	2 (Total of 7 pages)
Examination Request:	Not filed

TRANSPLANTATION DEVICE FOR AN INTRAOCULAR LENS

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[There are no amendments to this patent.]

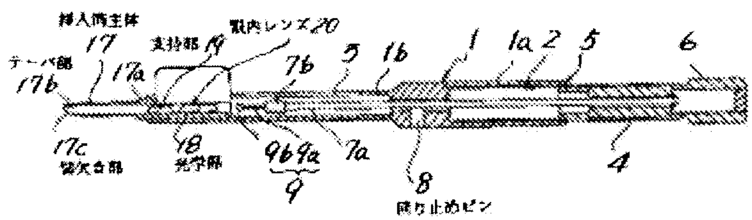
Abstract

Objective

It is to provide a transplantation device for an intraocular lens, making it possible to insert the optical part 18 of an intraocular lens 20 at the proper position inside an eye without causing any damage.

Constitution

An intraocular lens 20 with an elastic optical part 18 bent to a small size, retained inside an insertion cylinder 11 of retainer 10, and retainer 10 is attached to a main body 1 of the device. Subsequently, a main shaft 7 inserted in the main body 1 is allowed to advance, pushing the intraocular lens 20 from the tip of the insertion cylinder 11. At the tip of the insertion cylinder 11, a taper 17b is formed, this taper 17b is allowed to have a notched part 17c, wide open at the base, and thus when the intraocular lens 20 is pushed from the tip of the insertion cylinder 11, the intraocular lens 20 is gradually allowed to return to its large original shape and pushed out forward and obliquely on the side of the notched part.



Key:	8	Rotation restricting pin
	17	Insertion cylinder main unit
	17b	Taper
	17c	Notched part
	18	Optical part
	19	Supports
	20	Intraocular lens

Claims

1. A transplantation device for an intraocular lens characterized by being a transplantation device for an intraocular lens with the optical part made of a deformable elastic material having a predetermined memory characteristic, or a foldable hard material; the device having an approximately cylindrical main body, a linearly inserted main shaft movable in the axial direction inside the main body for pushing the intraocular lens out of the device, a drive mechanism to allow

said main shaft to advance or recede, and an insertion cylinder extruding from the tip of the main body, equipped with a retainer that positions and holds the intraocular lens in a small shape inside the insertion cylinder and freely detachable from the main body, forming a taper at the tip of said insertion cylinder; and having a notched part wide open at the base of the taper.

2. A transplantation device for an intraocular lens characterized by an optical part made of a deformable elastic material having a predetermined memory characteristic, or a foldable hard material; the device having an approximately cylindrical main body, a linearly inserted main shaft movable in the axial direction inside the main body for pushing the intraocular lens out of the device, a drive mechanism to allow said main shaft to advance or recede and an insertion cylinder extruding from the tip of the main body, equipped with a retainer that positions and holds the intraocular lens in a small shape inside the insertion cylinder and freely detachable from the main body; forming a taper at the tip of said insertion cylinder; and having multiple notches formed at multiple sites on the circumference of the taper along its length.

<u>Detailed explanation of the invention</u>

[0001]

Industrial application field

This invention pertains to a transplantation device for transplanting an intraocular lens to replace the crystalline lens excised at the time of cataract surgery.

[0002]

Prior art

Previously, the transplantation of artificial intraocular lenses, replacing the crystalline lenses excised at the time of cataract surgery, has been widely carried out. Since the first transplantation of an artificial polymethylmethacrylate (PMMA) intraocular lens into a human eye in 1949 by Ridley, many ophthalmological surgeons have been interested in the complications of intraocular lens transplantation at the time of cataract surgery, and were involved in solving the problems. Currently, those complications may be classified into the following 4 categories.

[0003]

Namely, they are postsurgical inflammation, posterior capsule opacification, intraocular lens deviation and postsurgical astigmatism. It is possible to use countermeasures against these complications, such as drug or lens surface treatment/biocompatibility improvement in the case of postsurgical inflammation, YAG laser treatment in the case of posterior capsule opacification and improved holding force with an improved intraocular lens in the case of intraocular lens deviation.

[0004]

However, postsurgical astigmatism very adversely effects the aim of obtaining good vision without eyeglasses after surgery. It has been attempted to eliminate postsurgical astigmatism by using a keratometer during surgeries, attempts at ingenious suturing or cutting, etc., but no satisfactory solution yet has been achieved. However, this problem is considered clearly related to the size of the incision, the smaller the surgical incision, the smaller the extent of postsurgical astigmatism.

[0005]

Small surgical incisions have become possible as a result of the development of a surgical procedure called Kelman's phacoemulsification (KPE) with an ultrasonic emulsifier-aspirator. According to this technique, the opacified crystalline lens is pulverized with the ultrasonic tip of the above device, emulsified and aspirated, making it possible to carry out cataract lens extraction with approximately a 4 mm incision. Consequently, small surgical incisions have become possible compared with the previously available extracapsular cataract extraction (ECCE) procedures requiring incisions of approximately 10 mm, small surgical incisions have become possible.

[0006]

Furthermore, in addition to small surgical incisions with the above surgical technique, there have been intraocular lenses developed for insertion through small incisions. The previously available intraocular lenses had optical parts made of a hard material such as glass or plastic, the incisions at the time of transplantation had to be larger than the diameter of the optical parts, generally about 6.5 mm or larger, and, even in the case of removing the crystalline lens from small incisions by KPE, the incisions often had to be enlarged at the time of hard intraocular lens insertion.

[0007]

However, as a result of the development of an intraocular lens with a deformable optical part made of an elastic material having prescribed memory characteristics as disclosed in Japanese Patent Application No. Sho 58[1983]-18005 (Japanese Kokai Patent Application No. Sho 58[1983]-146346), an intraocular lens with an optical part of a foldable hard material and a transplantation device making it possible to insert an intraocular lens through a small incision by compressing, rolling, bending, stretching or folding, the transplantation of an intraocular lens with an incision of approximately 4 mm has become possible, and the possibility of small surgical incisions has arisen from both improved surgical procedures and the intraocular lenses transplanted.

[0008]

Problem to be solved by the invention

However, the previously available transplantation device for the intraocular lens described above had the following problems because the transplantation of an intraocular lens into the eye was carried out by compression, reeling, bending, stretching or folding an intraocular lens with an optical part comprising a deformable elastic material having prescribed memory characteristics or an intraocular lens with a foldable optical part made of a hard material, thus reducing the shape from large to small; inserting a cylindrical or similarly shaped insertion cylinder at the tip of the transplantation device into the eye through a small incision in the eye; and operating the device to push the intraocular lens out of the insertion cylinder.

[0009]

Specifically, in the previously available intraocular lens transplantation device, the size of an intraocular lens with an optical part comprising a deformable elastic material having prescribed memory characteristics or an intraocular lens with a foldable optical part made of a hard material is reduced by carrying out compression, reeling, bending, stretching or folding; the intraocular lens is pushed into the eye from the cylindrical or similarly shaped insertion cylinder at the tip of the transplantation device while releasing the stress applied to the intraocular lens; and it is allowed to restore itself to its original memorized shape.

[0010]

Therefore, there were problems such as releasing the stress too quickly depending on the shape of the end of the insertion cylinder, causing the intraocular lens to pop out suddenly, damaging a part of the eye, setting the intraocular lens at a site other than the desired installation site because of difficulty determining the direction in which it will pop out, or damaging corneal endothelial cells as a result of the intraocular lens popping out toward the corneal endothelium.

[0011]

The objective of this invention is to solve the problems of the prior art described above and provide an intraocular lens transplantation device, making it possible to carry out transplantation so as to install the optical part at the proper site in the eye through a small incision without causing any damage to corneal endothelial cells, etc.

[0012]

Means to solve the problem

The intraocular lens transplantation device according to the Claim 1 of this invention is characterized by an optical part made of a deformable elastic material having a predetermined memory characteristic, or a foldable hard material; the device having an approximately cylindrical main body, a linearly inserted main shaft movable in the axial direction inside the main body for pushing the intraocular lens out of the device, a drive mechanism to allow said main shaft to advance or recede and an insertion cylinder extruding from the tip of the main body, equipped with a retainer that positions and holds the intraocular lens in a small shape inside the insertion cylinder and freely detachable from the main body; forming a taper at the tip of said insertion cylinder; and having a notched part wide open at the base of the taper.

[0013]

Furthermore, the intraocular lens transplantation device according to Claim 2 of this invention is characterized by being a transplantation device for an intraocular lens with the optical part made of a deformable elastic material having a predetermined memory characteristic, or a foldable hard material; the device having an approximately cylindrical main body, a linearly inserted main shaft movable in the axial direction inside the main body for pushing the intraocular lens out of the device, a drive mechanism to allow said main shaft to advance or recede and an insertion cylinder extruding from the tip of the main body, equipped with a retainer that positions and holds the intraocular lens in a small shape inside the insertion cylinder and that is freely detachable from the main body; forming a taper at the tip of said insertion cylinder; and having multiple notches formed at multiple sites on the circumference of the taper along its length.

[0014]

Effect of the invention

The intraocular lens transplantation device according to the Claim 1 or 2 of this invention positions and retains an intraocular lens by bending, reeling or folding it into a small shape inside the insertion cylinder of the retainer of the device, and the retainer in this state is attached in a freely detachable manner to the main body of the device while the end of the insertion cylinder of the retainer is allowed to extrude from the main body of the device. Subsequently, the drive mechanism is operated allowing the main shaft to advance forwards in the axial direction and carrying out the transplantation of the intraocular lens by allowing the tip of the main shaft to push the intraocular lens out of the end of the insertion cylinder of the device.

[0015]

In the invention according the Claim 1 of this invention, the end of the insertion cylinder is allowed to form a taper with a notched part wide open at the base of the taper, and thus, the stress of the intraocular lens retained in a small shape inside the insertion cylinder is not released quickly but gradually while passing the taper because of the notched part described above. Consequently, the original memorized shape of the intraocular lens is gradually restored while it is pushed from the end of the insertion cylinder, and even if the intraocular lens is inserted through a small incision, damage to the part of the eye coming into contact with the intraocular lens is prevented.

[0016]

Furthermore, since the tip of the insertion cylinder has the notch as well as the taper, the directionality of the intraocular lens is in the forward and oblique direction on the side of the notched part when it is discharged from the taper, and the intraocular lens can be installed at the proper position in the eye without hitting any corneal endothelial cells. In the invention according to Claim 2 of this invention, the end of the insertion cylinder has a taper and notches along its length at multiple sites around the circumference. Therefore, the intraocular lens retained in a small shape is gradually released with the notches of the taper while passing through the taper. As a result, the original memorized shape of the intraocular lens is gradually restored when it is discharged from the tip of the insertion cylinder by being pushed out, and even if the intraocular lens is installed through a small incision, damage to any part of the eye coming into contact with the intraocular lens is prevented. Furthermore, the spacing, length and number of notches formed in the taper of the insertion cylinder may be suitably adjusted to control the directionality of the intraocular lens discharged from the tip of the insertion cylinder in the straight or oblique direction, allowing installation of the optical part at the proper site in the eye without the intraocular lens coming into contact with any corneal endothelial cells.

[0017]

Application example

The first application example of a transplantation device according to Claim 1 of this invention is explained by referring to Figures 1-8 as follows. In Figures 1, 2 and 3, 1 is an approximately cylindrical main body of the device, a female thread 2 is formed on the inner surface at a large-diameter part 1a toward the back end of the main body 1 of the device, and on the outer surface of a small diameter part 1b on the front end, a retainer attachment groove 3 with a narrow width at the tip 3a is formed along the axial direction.

[0018]

A male threaded cylinder 4 is allowed to engage with the female thread 2 formed on the main body 1 of the device, drive mechanism 5 is configured with those parts as the main parts, and an operating part 6 is formed at the back end of the male threaded cylinder 4. The front end of the male threaded cylinder 4 holds the back end of a main shaft 7, which can rotate but is unable to move in the axial direction. The main shaft 7 is installed inside the main body 1 concentrically with the main body 1, extended on the front end, its bottom part is notched flatly along the axial direction to form a notched part 7a, the notched part 7a is allowed to engage with the end of a rotation restricting pin 8 installed at the bottom of the main body 1 and extruding inside the main body 1, and the main shaft 7 is held so that it can rotate in the axial direction but is unable to move with respect to the main body 1 of the device.

[0019]

The front end of the main shaft 7 has a large diameter guide 7b and, as shown in Figure 4, a pusher 9b is formed as a single body by a small outer diameter part 9 at a front end 9a in front of the guide 7b. The pusher 9b is formed in an oval flat shape by removing top and bottom surface parts and has an outer diameter markedly smaller than the inner diameter of an insertion cylinder 11 of a retainer 10 described later.

[0020]

As shown in Figure 5, the retainer 10 has a pair of retainer plates 12 and 13, which are moldings of a flexible synthetic resin with the bottom edge of the one retaining plate 12 forming a single body with the base end of an insertion cylinder main unit 17 and one half of a divided cylinder 14, the bottom edge of the other retaining plate 13 forming a single body with the other half of the divided cylinder 15 and bottom edges of the divided cylinder pieces 14 and 15 with a hinge 16. Furthermore, the other retaining plate 13 and divided cylinder piece 15 open or close with respect to the one retaining plate 12 and divided cylinder piece 14 at the hinge 16, the divided cylinder pieces 14 and 15 are concentric and of the same diameter as the insertion cylinder main unit 17 in the closed state, and the insertion cylinder 11 comprises the insertion cylinder main unit 17 and divided cylinder pieces 14 and 15.

[0021]

Furthermore, the insertion cylinder main unit 17 has a large diameter part 17a at the back end and taper 17b at the front end. As shown in Figure 6 as an enlarged drawing, the bottom side of the taper 17b has a notched part 17c formed with the base end largely notched in an oblique

manner, and the notched part 17c is allowed to form an oblique angle of 60° with respect to the tip surface perpendicular to the axial direction of the insertion cylinder main unit 17.

[0022]

Figure 7 shows a conventional intraocular lens to be transplanted with the transplantation device of the first application example. In Figure 7, 18 shows an optical part made of a deformable elastic material having prescribed memory characteristics, 19 shows a pair of thread-shaped supports attached to the outer circumference of the optical part 18 at the base ends and made of a flexible material having a certain level of hardness and springiness but easily deformable with an applied external force, and the optical part 18 and supports 19 constitute an intraocular lens 20. The supports 19 described above are extended in a curved manner from the outer circumference of the optical part 18 and symmetrically on both sides of the diameter d of the optical part 18.

[0023]

Furthermore, the specific material for the optical part 18 includes polyurethane elastomers, silicone elastomers, hydrogel polymers, collagen compounds, etc., and the supports 19 are made of polyimides, etc.

[0024]

The transplantation of the intraocular lens 20 shown in Figure 7 with the transplantation device of the first application example is carried out as follows. First of all, the retaining plate 13 and divided cylinder piece 15 of the retainer 10 are opened, and the intraocular lens 20 is installed with the pair of supports 19 positioned with one at the front and the other at the back. Subsequently, the retaining plate 13 and divided cylinder piece 15 are closed to combine with the retaining plate 12 and divided cylinder piece 14 and retain the optical part 18 by allowing it to form a small shape by folding double in a curved manner inside the divided cylinder pieces 14 and 15 and at the same time and carrying out positioning.

[0025]

In this retained state, the insertion cylinder 11 comprises the divided cylinder pieces 14 and 15, and an insertion cylinder main unit 17 is inserted inside the main body 1 of the device from the base side of the retainer attachment groove 3 of the main body 1 of the device. The retaining plates 12 and 13 with a hand extruding from the main body 1 of the device are held closed and advanced to the front side of the main body 1 of the device, allowing the retaining plates 12 and 13 to become engaged with and supported by the narrow tip 3a of the above retainer attachment

groove 3, and at the same time the front end of the insertion cylinder main unit 17 is allowed to extrude from the tip of the main body 1 of the device.

[0026]

Subsequently, the operating part 6 of the a drive mechanism 5 is held to make a positive rotation of the male threaded cylinder 4 causing the main shaft 7 to advance with the male threaded cylinder 4, which was in a withdrawn position because of the threaded engagement of the male threaded cylinder 4 and the female thread 2 formed inside the main body 1 of the device. In this case, the main shaft 7 is engaged at the notched part 7a with the rotation restricting pin 8 attached to the main body 1 of the device, and consequently it is allowed to advance without any rotation along the axis.

[0027]

As a result of this forward movement of the main shaft 7, its tip comes into contact with the intraocular lens 20, and the intraocular lens 20 is pushed from the insertion cylinder 11 out of the device. In this case, the main shaft 7 advances straight inside the insertion cylinder 11 guided by guide 7b, the pusher 9b installed at the front end 9 of the main shaft 7 with the partially removed top and bottom opposite each other and its shape allowed to have an outer diameter smaller than the inner diameter of the insertion cylinder 11, and furthermore the intraocular lens 20 is retained inside the insertion cylinder 11 with the optical part 18 in a double-folded curve with the supports 19 positioned front and back inside the insertion cylinder 11. Therefore, the pusher 9a of the main shaft 7 does not come into contact with the supports 19 of the intraocular lens 20, but only the optical part 18 is pushed allowing the intraocular lens 20 to move forward inside the insertion tube 11 without any deformation of the supports 19 and be discharged from the tip of the insertion cylinder 11 into the eye.

[0028]

Furthermore, the front end of the insertion cylinder main unit 17 has the taper 17b and at the bottom side of the taper 17b, notched part 17c with the base end largely notched in an oblique manner, and, as a result, the stress of the intraocular lens 20 forced into a small shape is gradually released because of the notched part 17c while passing through the taper 17b of the insertion cylinder main unit 17.

[0029]

Consequently, the intraocular lens 20 is pushed without popping out of the tip of the insertion cylinder main unit 17, and the original memorized shape is gradually restored.

Furthermore, the notched part 17c is formed at the bottom side of the taper 17b, the intraocular lens 20 is in forward and obliquely downward when it is discharged from the taper 17b as shown in Figure 8, and consequently it does not come into contact with the corneal endothelial cells.

[0030]

In addition, the optical part 18 is restored to its original large shape before curving deformation with the elastic restoration forces based on its memory characteristics, and the intraocular lens 20 discharged from the insertion cylinder 11 in the prescribed shape is transplanted inside the crystalline lens capsule while being supported by the supports 19 because the insertion cylinder 11 enters the crystalline lens capsule through a small incision. Incidentally, to advance the intraocular lens smoothly in insertion cylinder 11, a suitable viscoelastic material may be placed inside the insertion cylinder 11, and the intraocular lens 20 is discharged together with this substance used as a lubricant. Furthermore, after the transplantation of the intraocular lens 20, the main shaft 7 is allowed to recede by operating the drive mechanism 5, and, at the same time, the retainer 10 is removed from the main body 1 of the device.

[0031]

Figures 9 and 10 show respective examples of the tip of the insertion cylinder main unit 17 in modified examples which differ from the first application example of this invention. The taper 17b has the notched part 17c formed at the front bottom, and the oblique notch angle of the notched part 17c with respect to the front surface of the insertion cylinder main unit 17 is 45° in the example shown in Figure 9, or the notched part 17c with respect to the front surface of the insertion cylinder main unit 17 is 30° in the example shown in Figure 10. With the insertion cylinder having the insertion cylinder main unit 17 shown in Figure 9 or 10, it is possible to expect approximately identical action as that of the first application example described above.

[0032]

Figure 11 shows the tip of an insertion cylinder main unit 17 in the second application example according to Claim 2 of this invention. The tip of the insertion cylinder main unit 17 in the second application example according to Claim 2 of this invention has a taper 17b, and notches 17d along its length are formed at 3 sites around the circumference of the taper 17b. The notches 17d cover the whole length of the taper 17b, equally spaced around the circumference, and penetrate through the taper 17b in the direction of thickness. Incidentally, the configuration of the second application example is the same as that of the first application example except for the difference described above.

[0033]

Furthermore, because the taper 17b is formed at the tip of the insertion cylinder main unit 17, and the notches 17d along its length are formed at 3 sites around the circumference, when the intraocular lens 20 passes through the taper 17b of the insertion cylinder main unit 17, the stress is gradually released because the diameter of those parts at the notches 17d of the taper 17b is increased as a result of partial elastic deformation. Therefore, the intraocular lens 20 is discharged by being pushed instead of popping out of the tip of the insertion cylinder main unit 17, the original memorized shape is gradually restored, and damage to the inner parts of the eye coming into contact with the intraocular lens 20 is prevented. Furthermore, in the second application example, the direction in which the intraocular lens 20 moves is straight forward.

[0034]

Incidentally, the number of notches 17d formed in the taper 17b is in the range of about 2-10, and it is possible to achieve the same action as that of the first application example for the direction moving from the tip of the insertion cylinder main unit 17 in the obliquely downward and forward direction by suitably adjusting the spacing, length and number of the notches 17d or partially changing the spacing or length.

[0035]

In this invention, the optical part of the intraocular lens may be made of a foldable hard material, and the shape of the supports is also suitably changeable, and the intraocular lens is not necessarily limited to the double-folded curve one of the above application examples, but can be selected from among these lenses as long as they have at least an optical part that can be made into a small shape by reeling, bending, folding, etc., and have memory characteristics that allow restoration to the original large size after being pushed from the insertion cylinder.

[0036]

Furthermore, in this invention, the drive mechanism is changeable to various other forms such as a piston, etc., as long as the linear reciprocal motion of the main shaft along the axial direction is possible inside the main body of the device, and the tip of the main shaft is not necessarily restricted to the shape shown in the above application examples, as long as it has a diameter smaller than the inner diameter of the insertion cylinder, and it is possible to push only the optical part of the intraocular lens.

[0037]

Effect of the invention

As explained above in detail, this invention is an intraocular lens transplantation device characterized by an optical part made of a deformable elastic material having a predetermined memory characteristic, or a foldable hard material; the device having an approximately cylindrical main body, a linearly inserted main shaft movable in the axial direction inside the main body for pushing the intraocular lens out of the device, a drive mechanism to allow said main shaft to advance or recede and an insertion cylinder extruding from the tip of the main body, equipped with a retainer that positions and holds the intraocular lens in a small shape inside the insertion cylinder and freely detachable from the main body; forming a taper at the tip of said insertion cylinder; and having a notched part wide open at the base of the taper, and, as a result, it is possible to obtain the following effects.

[0038]

Specifically, in the intraocular lens transplantation device of this invention, the intraocular lens is positioned and retained by bending, reeling or folding the optical part into a small shape inside the insertion cylinder of the retainer of the device, and the retainer in this state is attached to the main body of the device in a freely detachable manner with the front end of the insertion cylinder allowed to extrude from the tip of the main body of the device. Subsequently, the main shaft is allowed to move forwards along the axial direction with a drive mechanism pushing only the optical part of the intraocular lens with the tip of the main shaft and transplanting the intraocular lens into the eye by pushing the intraocular lens out of the tip of the insertion cylinder of the device.

[0039]

Furthermore, in this invention, the front part of the insertion cylinder is allowed to have a taper, and the taper is allowed to form a notched part wide open at the base, or the taper is allowed to have notches along its length at multiple sites in the circumference of the taper, the stress of the intraocular lens, compressed to a small size inside the insertion cylinder, is gradually released instead of being quickly and suddenly released because of the notched part or notches when the intraocular lens passes through the taper.

[0040]

Consequently, the intraocular lens is gradually allowed to return to its original large shape when it is pushed from the tip of the insertion cylinder, and even if the intraocular lens is installed through a small incision, damage to the parts of the eye coming into contact with the intraocular

lens is prevented. Furthermore, the front end of the insertion cylinder is tapered, and if this taper has a notched part, the intraocular lens discharged from the taper in the obliquely downward and forward direction, or if the taper has notches, the directionality of the intraocular lens is controllable by adjusting the spacing, length and number of the notches to straight forward, bending in the downward oblique direction, etc., and consequently, it is possible to install the intraocular lens at the proper site in the eye without the intraocular lens coming into contact with corneal endothelial cells.

Brief description of the figures

Figure 1 is a plan view drawing showing an intraocular lens transplantation device according to the first application example of this invention.

Figure 2 is a cross-sectional drawing of Figure 1 along the line A-A.

Figure 3 is an oblique-view of Figure 1 with a part removed.

Figure 4 is an enlarged oblique-view of Figure 1 showing the guide and tip of the main shaft of the figure.

Figure 5 is an enlarged oblique-view of Figure 1 showing the retainer of the figure in an opened state.

Figure 6 is a plan view drawing showing the tip of the insertion cylinder main unit of the insertion cylinder of Figure 1.

Figure 7 is a plan view drawing showing one example of the intraocular lens.

Figure 8 is an oblique-view explanatory drawing showing the state of usage of the insertion cylinder main unit of the insertion cylinder of Figure 1.

Figure 9 is an enlarged side-view drawing showing the tip in one modified example of the first application example of this invention.

Figure 10 is an enlarged side-view drawing showing the tip in another modified example of the first application example of this invention.

Figure 11 is an enlarged oblique-view drawing showing the tip of the insertion cylinder main unit in the second application example of this invention.

Explanation of symbols

1 Main body of the device
3 Retainer attachment groove
4 Male threaded cylinder
5 Drive mechanism
6 Operating part
7 Main shaft

8	Rotation restricting pin
9	Main shaft tip
10	Retainer
11	Insertion cylinder
17	Insertion cylinder main unit
17b	Taper
17c	Notched part
17d	Notches
18	Optical part
19	Supports
20	Intraocular lens

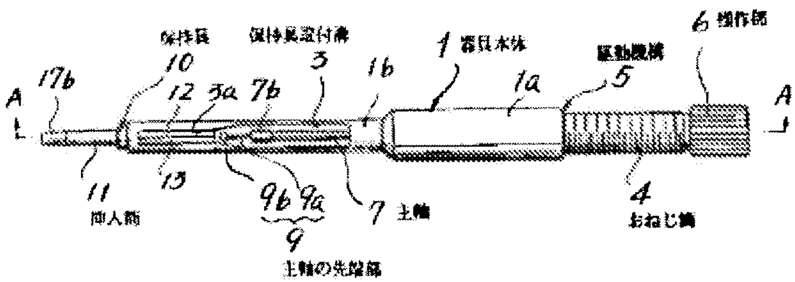


Figure 1

Key:

1	Main body of the device
3	Retainer attachment groove
4	Male threaded cylinder
5	Drive mechanism
6	Operating part
7	Main shaft
9	Main shaft tip
10	Retainer
11	Insertion cylinder

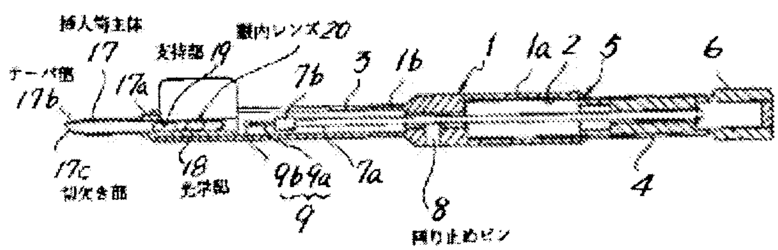


Figure 2

Key:
8	Rotation restricting pin
17	Insertion cylinder main unit
17b	Taper
17c	Notched part
18	Optical part
19	Supports
20	Intraocular lens

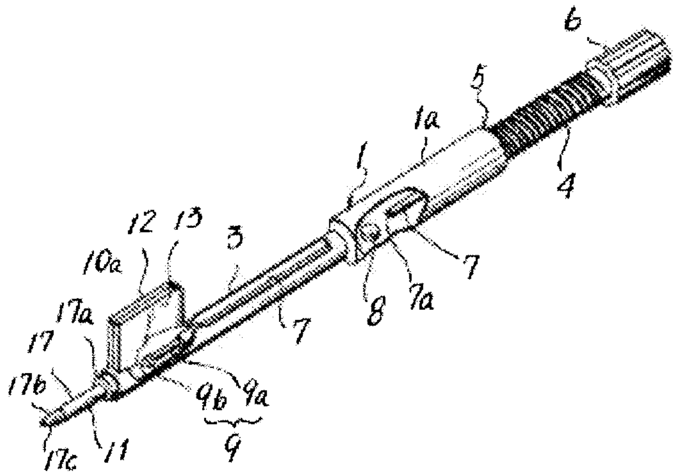


Figure 3

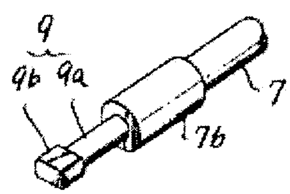


Figure 4

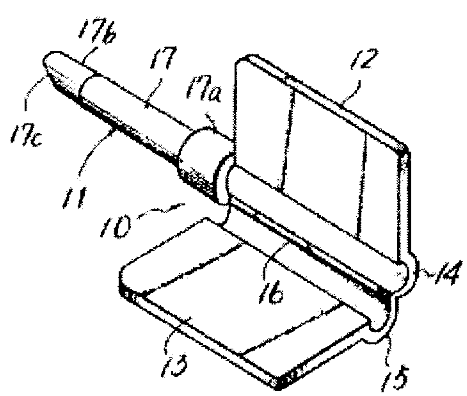


Figure 5

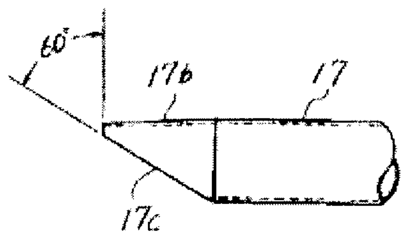


Figure 6

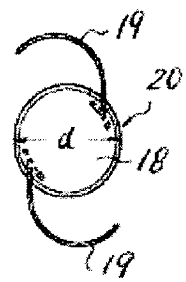


Figure 7

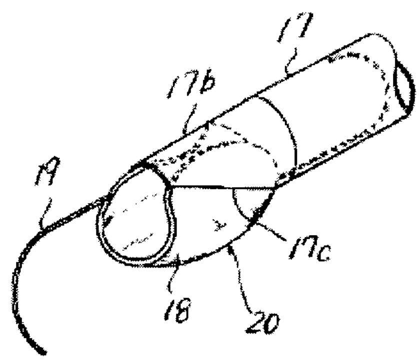


Figure 8

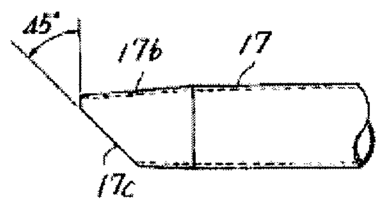


Figure 9

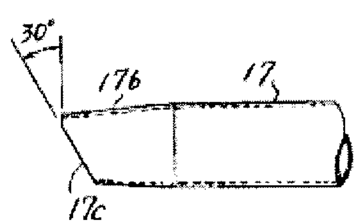


Figure 10

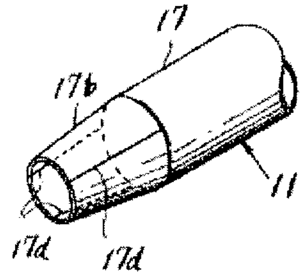


Figure 11